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Four new narrow-range endemic species of *Gulella* from Eastern Cape, South Africa (Mollusca: Pulmonata: Streptaxidae)

by

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ABSTRACT

Gulella dejae sp. n., *G. hamerae* sp. n., *G. latimerae* sp. n. and *G. newmani* sp. n. are described from the Transkei region, Eastern Cape, South Africa. All are unusual amongst southern African *Gulella* species in having a peristome which is not interrupted in the parietal region, *G. latimerae* sp. n. and *G. newmani* sp. n. also being exceptional in having a detached apertural tube. The conservation of the species is discussed in relation both to their restricted ranges and to the vulnerability of forest habitats in which they occur. All appear to meet the criteria for red-listing as threatened species.

INTRODUCTION

This paper forms part of a study investigating the diversity, biogeography and conservation of the malacofauna of the forests of the Transkei region, Eastern Cape, South Africa. The purpose of the present contribution is to describe four new, distinctive species of the genus *Gulella* Pfeiffer, 1856 (family Streptaxidae), which have been discovered during recent field excursions undertaken as part of this larger study. They are evidently narrow-range endemic species, and therefore relevant to analysis of endemicity patterns and the delineation of regions of conservation concern. The streptaxid fauna of the coast between subtropical KwaZulu-Natal and the warm-temperate south-eastern Cape is not well known, having been sampled only sporadically during the first half of the twentieth century by H. J. Puzey (died late 1960s) and W. G. Rump (1880–1949), and a number of other local streptaxid enthusiasts. The discovery of four undescribed species in the region, after relatively little additional collecting, indicates that much remains unknown in relation to the molluscan fauna of this interesting transitional biogeographic region.

All four species are unusual in that the peristome is entire. In the three species from coastal forests, the peristome is disjunct from, or at least not fused to, the base of the preceding whorl in the parietal region. In *G. hamerae* it is fused to the base of the penultimate whorl, but is not interrupted and its edge forms a continuous, well-defined limit to the aperture. The only other South African *Gulella* species in which the peristome to the left of the parietal lamella is uninterrupted, are *G. claustralis* Connolly, 1939, *G. phyllisae* Burnup, 1914, *G. peakei continentalis* Bruggen, 1975, and *G. salpinx* Herbert, 2002. The latter two species differ from the new taxa in many features of sculpture and apertural dentition, and only *G. claustralis* and G. *phyllisae* are genuinely comparable. In the following descriptions therefore, comparative remarks will largely focus on how the new taxa differ from these two species, and from one another.

Insufficient material was available to permit examination of the soft parts, and no juvenile shells have been collected. Descriptions thus relate to the adult shell only. In view of this, and the general lack of robust characters diagnosing subgeneric taxa within the highly speciose *Gulella* complex, we refrain from assigning the species to subgenera and refer them simply to *Gulella sensu lato*. Species of the subgenus *Aenigmigulella* Pilsbry & Cockerell, 1933, frequently have a detached peristome, but in such taxa the parietal lamella is very large and has an external (adapical) channel, and it curves strongly to the right (more so than in most *Gulella* spp.) such that the sinus opens laterally rather than frontally [ventrally](Adam 1965). Species of *Costigulella* Pilsbry, 1919, may also have an entire peristome, but characteristically they have axial ribs on all but the first half whorl of the embryonic shell, a feature not present in any of the species described below. The spiral sculpture present on the embryonic shell of three of the new species is a character shared with species of *Avakubia* Pilsbry, 1919 and *Conogulella* Pilsbry, 1919, but these taxa have apertural dentition of a very different form.

MATERIALS AND METHODS

The material was obtained during the course of wet-season, field excursions to the Transkei region, from 2000–2004. Specimens were collected either by direct searching or from leaf-litter samples which were dried, sieved, and picked over in the laboratory. For SEM purposes, specimens were sonicated briefly, rinsed and air-dried via 75% ethanol, mounted on stubs, coated with gold-palladium and examined at low accelerating voltage (5–10 kv) in a Hitachi S-570 scanning electron microscope.

ABBREVIATIONS

ELM – East London Museum, South Africa.
NMSA – Natal Museum, Pietermaritzburg, South Africa.
NMW – National Museum of Wales, Cardiff.
RMNH – Nationaal Natuurhistorisch Museum, Leiden [Museum Naturalis].

TAXONOMY

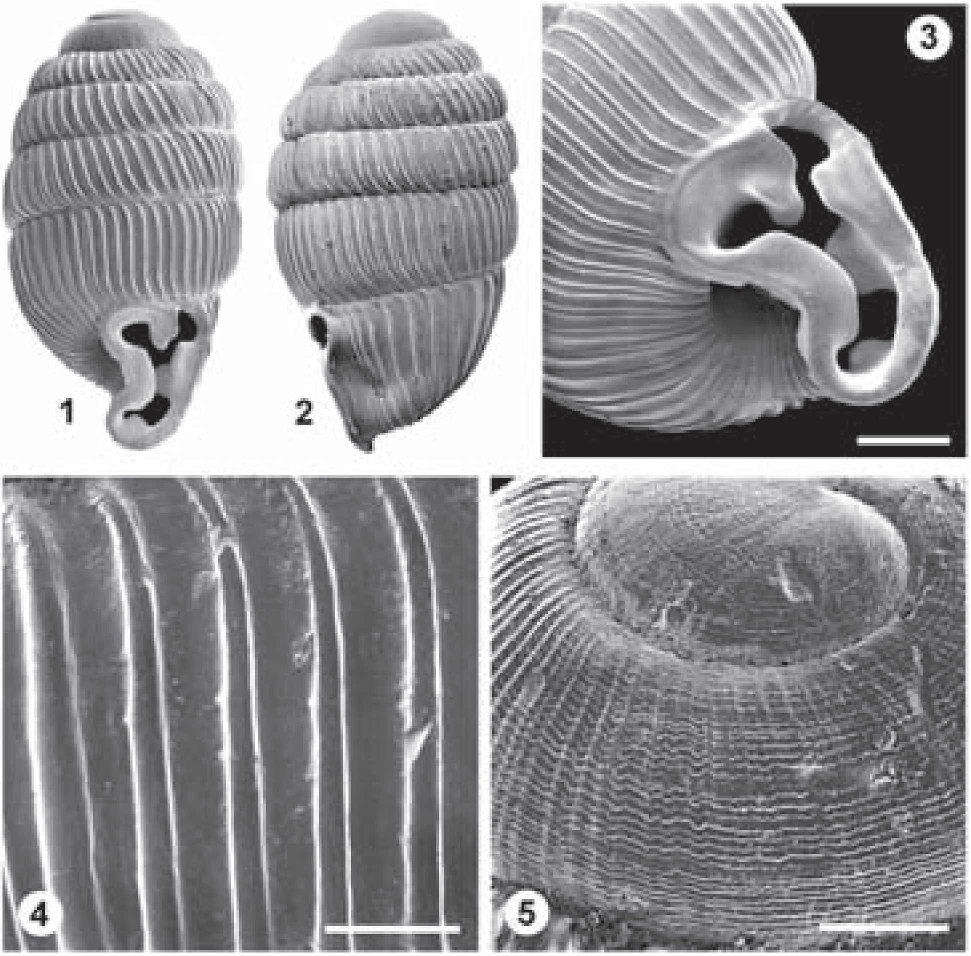
Gulella Pfeiffer, 1856

Gulella hamerae sp. n.

Figs 1–5, 24

Etymology: Named for Dr Michelle Hamer, University of KwaZulu-Natal, who has devoted much time and effort to the study and conservation of southern African invertebrates.

Diagnosis: Shell minute, oval-cylindrical; sculptured with strong axial ribs; peristome entire, but fused to base of preceding whorl in parietal region; aperture y-shaped, columella strongly indented; dentition five-fold: a parietal lamella, two labral denticles, a basal denticle and a large curved superficial tooth on indented columella; embryonic



Figs 1–5. *Gulella hamerae* sp. n., holotype. 1, 2, apertural and lateral views of shell, length = 2.7 mm; 3, oblique view into aperture, bar = 0.25 mm; 4, detail of sculpture (start of last whorl), bar = 100 µm; 5, microsculpture on embryonic shell, bar = 100 µm.

shell sculptured with close-set, spiral lirae; umbilicus open, relatively wide (width 1.4–1.6 mm) and deep.

Description: Shell minute, oval-cylindrical, length 2.7–3.1 mm, width 1.5–1.65 mm; length:width 1.70–1.96. Embryonic shell approx. 0.88 mm in diameter, comprising approx. 2.25 whorls; sculptured more or less throughout with close-set, microscopic raised spiral threads (Fig. 5), last half whorl also with fine, close-set axial riblets radiating from suture; junction between embryonic shell and teleoconch distinct. Teleoconch comprising approx. 4.5 whorls; first whorl convex, but subsequent ones rather more flat-sided; suture narrowly indented; sculpture of strong, sigmoid axial ribs, extending from suture to suture (47–49 on penultimate whorl); prosocline on spire whorls and almost orthocline on last whorl; rib intervals lacking obvious microsculpture (Fig. 4) and with only occasional traces of spiral threads on sides of ribs. Peristome entire and fused with base of penultimate whorl in parietal region, flaring outward elsewhere. Aperture constricted, y-shaped with lower limb curving toward shell axis, columella strongly indented; apertural dentition five-fold (Fig. 3): 1) a strong parietal lamella, outer portion oblique and then curving inward so that remainder runs into the aperture more or less at right angles, a distinct ridge-like swelling at point of curvature; 2-3) two broad labral teeth, upper one flat-topped and level with apertural margin, lower one flat-topped or somewhat rounded and inset well behind upper one; 4) a deep-set, small, transverse basal tooth; 5) a large curved columella tooth level with aperture margin, but angled inward basally; a lamella on inner part of columella is not evident. Labral complex corresponds with an external pit behind flaring outer lip. Umbilicus relatively wide (width 1.4–1.6 mm) and deep, with a conspicuous pit underlying columella tooth. Shell translucent, uniformly milky-white when fresh.

Type material: Holotype: NMSA W1217/T1999, length 2.7 mm, width 1.52 mm. South Africa, Eastern Cape, Transkei, Nqadu Forest, north of Umtata, leg. H.J. Puzey (undated).

Paratype 1, NMSA V9127/T1998, Eastern Cape, Transkei, Nqadu Forest (31º25.665'S: 28°45.118'E), north of Umtata, leg. D. Herbert, 12/v/2001.

Paratypes 2, 3, NMSA W223/T2009, paratype 4, NMW Z.2004.030.00001 and paratype 5, ELM 13661, Eastern Cape, Transkei, Nqadu Forest, north of Umtata, leg. W.G. Rump, 1935.

Paratypes 6,7, RMNH 98152, Eastern Cape, Transkei, Nqadu Forest, north of Umtata, leg. W.G. Rump, 1935, *ex* coll'n W. Falcon, don. H. Boswell via A.C. van Bruggen.

Distribution and habitat (Fig. 24): Known only from Nqadu Forest, north of Umtata, Eastern Cape; Transkei mist-belt forest, in leaf-litter.

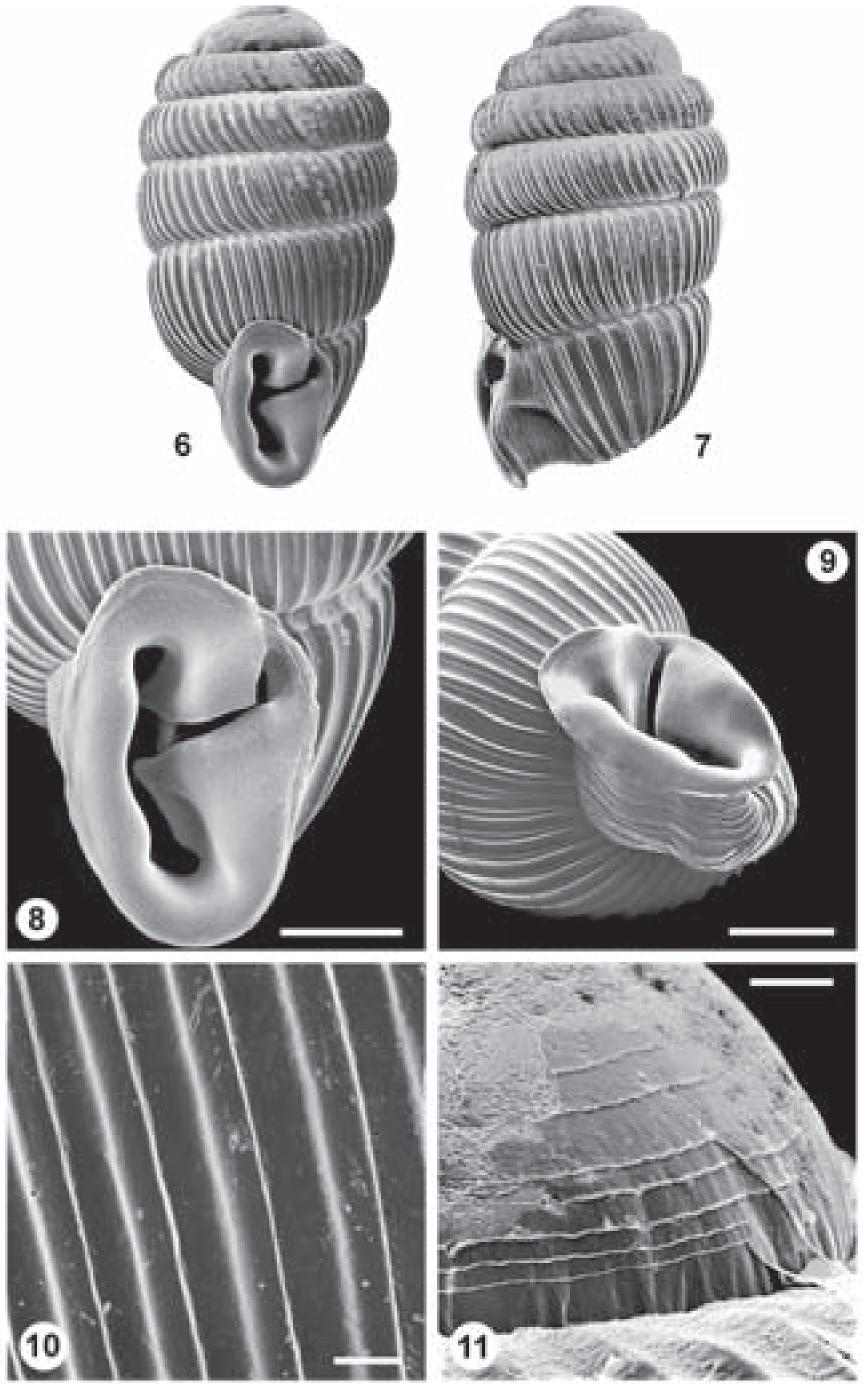
Remarks: *G. hamerae* is evidently related to *G. claustralis* Connolly, 1939, a species known only from two mist-belt forest localities in northern Pondoland and southern KwaZulu-Natal (Herbert & Kilburn 2004). The strong axial sculpture, y-shaped aperture, entire peristome, indented columella lip, and spirally striate embryonic shell are evidence of this. It differs, however, in the form of the labral teeth (lower cusp absent) and in its much more strongly indented columella, the inner margin of which possesses a single strong, smoothly curved tooth, instead of two distinct teeth. In terms of its columella morphology, *G. hamerae* somewhat resembles *G. incurvidens* Bruggen, 1972, from the northern Drakensberg and Soutpansberg (Mpumalanga and Limpopo provinces), but that species evidently lacks spiral sculpture on the embryonic shell, has a single in-running labral tooth and the basal part of its aperture is twisted obliquely upward. It seems probable that *G. hamerae* and *G. claustralis* are sister taxa, having evolved from fragmented populations of a single, more widespread progenitor.

Gulella dejae sp. n.

Figs 6–11, 24

Etymology: Named for D.-J. Hodgkinson of East London, who has assisted us on many field trips to the Transkei coast.

Diagnosis: Shell minute, sculptured with strong axial ribs; peristome entire, abutting but not fused to preceding whorl in parietal region; aperture markedly constricted by teeth; dentition five-fold, labral tooth morphology distinctive; apertural tube behind



Figs 6–11. *Gulella dejae* sp. n., holotype. 6, 7, apertural and lateral views of shell, length = 2.8 mm; 8, enlarged view of the aperture, bar = 0.3 mm; 9, umbilical region, bar = 0.3 mm; 10, detail of sculpture (start of last whorl), bar = 50 µm; 11, microsculpture on embryonic shell, bar = 40 µm.

columella lip somewhat expanded and collar-like; umbilicus very small, displaced dorsally.

Description: Shell minute, obovate-cylindrical to sub-cylindrical, length up to 2.85 mm, width up to 1.5 mm; length:width 1.84–2.03. Embryonic shell approx. 0.85 mm in diameter, comprising approx. 2.25 whorls; for the most part sculptured with relatively widely, but unevenly spaced microscopic spiral threads (Fig. 11); junction between embryonic shell and teleoconch distinct. Teleoconch comprising approx. 4.75 whorls; whorls moderately convex, suture relatively narrow and strongly indented, thus appearing somewhat channelled; sculptured by well-developed axial ribs, extending from suture to suture (42–47 on penultimate whorl); rib intervals lacking obvious microsculpture and with no evidence of spiral threads (Fig. 10). Peristome flaring outward, more or less entire; abutting base of penultimate whorl in parietal region, but not obviously fused to it. Aperture markedly constricted by teeth, dentition five-fold (Figs 8, 9): 1) a strong parietal lamella, outer portion oblique, partially concealing anal sinus and with a slight hiatus in the peristome behind it (not smoothly continuous with portion of sinus bounded by outer lip); 2) a large, trigonal, wedge-like labral slab, its upper margin in the form of a strong angular ridge running deeply into aperture, more or less parallel to lower margin of parietal lamella, angled progressively more toward columella internally; 3-4) two low, broad, rounded denticles on columella lip, separated by a smoothly curving, shallow indentation; 5) a broad columella lamella, but this scarcely visible through aperture. Labral tooth corresponds with a deep pit behind flaring outer lip. Apertural tube behind columella lip somewhat inflated and collar-like; umbilicus very small, displaced dorsally. Shell translucent, uniformly milky-white when fresh.

Type material: Holotype: NMSA W1840/T2011, length 2.8 mm, width 1.52 mm. South Africa, Eastern Cape, Pondoland coast, Mntafufu, north side of river (31.55596ºS: 29.62606ºE), coastal scarp forest, sorted from leaf-litter, leg. D. Herbert & M. Bursey, 29/iv/2004.

Paratype 1, NMSA W1883/T2010, South Africa, Eastern Cape, Pondoland coast, Mntafufu, south side of river (31.55021ºS:29.61777ºE), coastal scarp forest, beside road through forest, in leaf-litter, leg. D.-J. Hodgkinson, 29/iv/2004.

Distribution and habitat (Fig. 24): Known only from coastal scarp forest immediately north and south of the Mntafufu River mouth in Eastern Cape; in leaf-litter.

Remarks: *Gulella dejae* is clearly similar to the Eastern Cape *G. phyllisae* Burnup, 1925, in terms of size, shape and strong axial sculpture, and also with regard to the form of the peristome and the presence of spiral threads on the embryonic shell. In *G. phyllisae*, however, the labral tooth is in the form of a large, quadrate to bluntly trigonal slab which lacks a strong in-running ridge on its upper margin, and it has an additional deep-set basal tooth to the right of centre. Furthermore, the columella, though also somewhat thickened in *G. phyllisae*, lacks distinct teeth. *G. arnoldi* (Sturany, 1898) from the KwaZulu-Natal south coast is likewise similar, particularly the 'variety' *collaris* Burnup, 1925, from Port Shepstone, which also has an expanded apertural tube behind the columella lip, but its peristome is generally interrupted in the parietal region, its apertural dentition is closer to that of *G. phyllisae* and the parietal lamella generally runs smoothly into the outer lip, around the sinus. Southern populations of *G. phyllisae*

(Port Alfred) also show similar expansion of the apertural tube behind the columella lip and have a correspondingly smaller umbilicus.

Gulella latimerae sp. n.

Figs 12–17, 24

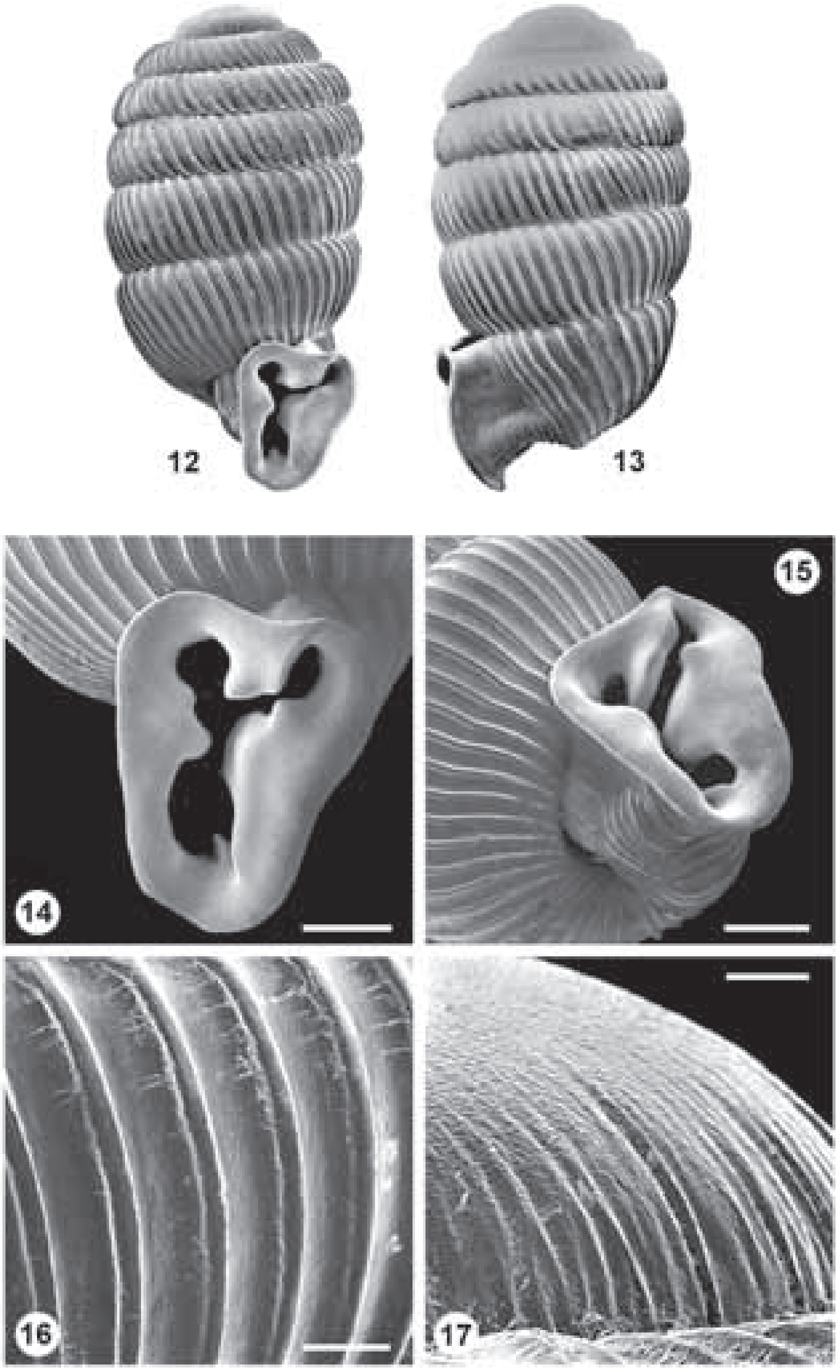
Etymology: Named after Dr Marjorie Courtenay-Latimer, first curator of the East London Museum, well known for her discovery of the first living coelacanth, *Latimeria chalumnae*.

Diagnosis: Shell small, sub-cylindrical; sculptured with strong axial ribs; peristome entire, disjunct from penultimate whorl in parietal region and forming a short, detached apertural tube, margin strongly flaring; apertural dentition six-fold; umbilicus narrow (approx. 0.8 mm).

Description: Shell small, sub-cylindrical, relatively broad; length 3.98–4.44 mm, width 2.16–2.40 mm; length:width 1.83–1.95. Embryonic shell approx. 1.28 mm in diameter, comprising approx. 2.25 whorls; initially with only an extremely fine, microscopically shagreened sculpture, but with slit-like, axial grooves appearing above abapical suture on second whorl (Fig. 17), these becoming progressively stronger and transforming into fine, close-set axial riblets on final part of embryonic shell; no trace of spiral sculpture; junction between embryonic shell and teleoconch distinct. Teleoconch comprising approx. 5.25 whorls; whorls strongly convex, suture strongly indented; sculptured by well-developed, prosocline axial ribs, extending from suture to suture (47–49 on penultimate whorl); rib intervals lacking obvious microsculpture and with no evidence of spiral threads except for feeble traces just below suture (Fig. 16). Peristome entire; terminal part of last whorl disjunct from preceding whorl and drawn out into a short, detached apertural tube; tube constricted behind basal lip. Apertural dentition six-fold (Figs 14, 15): 1) a well-developed parietal lamella, outer portion strongly oblique, its lower margin weakly sinuous; 2) a compound, broad-based labral tooth, with an in-running, roundly triangular slab at its centre, this with a small pointed denticle at its upper base, defining lower part of labral sinus, lower margin of labral slab buttressed but without a discrete tooth; 3) an oblique in-running basal ridge commencing just to right of centre, but not extending to aperture edge; 4) a broad, low, indistinct ridge to left of centre, at base of columella lip (and mostly obscured by it), running inward parallel to basal ridge (not visible in figures); 5) a bicuspid tooth on upper part of columella, comprising two in-running ridges united at apertural edge; 6) a large, rounded, deep-set columella lamella, excavated in centre. Exterior of apertural tube strongly indented in region of labral, basal and columellar teeth, appearing constricted in lateral view (Fig. 13). Umbilicus relatively narrow (width approx. 0.8 mm), its opening semi-circular to crescentic (Fig. 15). Shell translucent, uniformly milky-white when fresh.

Type material: Holotype: NMSA, W1426/T1997, length 4.32 mm, width 2.36 mm. South Africa, Eastern Cape, Transkei, Kumqolo Forest (32º09.553'S:28º59.12'E), 500 m upstream of Xora River mouth, steeply sloping southern side, in leaf-litter, leg. M. Bursey, viii/2001.

Paratype 1: ELM 13663, South Africa, Eastern Cape, Transkei, Dwesa Nature Reserve, coastal forest along road east of camp (32.28ºS:28.842ºE), in leaf-litter, leg. M. Bursey, 7/iii/2000.



Figs 12–17. *Gulella latimerae* sp. n., holotype. 12, 13, apertural and lateral views of shell, length = 4.32 mm; 14, enlarged view of the aperture, bar = 0.4 mm; 15, umbilical region, bar = 0.5 mm; 16, detail of sculpture (end of penultimate whorl and start of last whorl), bar = 100 µm; 17, microsculpture on embryonic shell, bar = 50 µm.

Paratype 2: NMSA W1817/T2012, South Africa, Eastern Cape, Pondoland coast, environs of Mntafufu River mouth, south side of river (31.55021ºS:29.61777ºE), coastal scarp forest, amongst talus and leaf-litter at base of road cutting, leg. D. Herbert & M. Bursey, 29/iv/2004.

Paratype 3: ELM 13901, as paratype 2, but on northern side of Mntafufu River mouth (31.55596ºS:29.62606ºE) coastal scarp forest, in soil inside dead achatinid snail, leg. M. Bursey & D. Herbert, 29/iv.2004.

Distribution and habitat (Fig. 24): Known from three localities along the coast of the Transkei region of Eastern Cape, from the mouth of the Mntafufu River in the north to Dwesa Nature Reserve in the south. These localities are separated by a straight line distance of only approx. 110 km.

Found in patches of coastal scarp forest, in leaf-litter. The type locality, Kumqolo Forest, is heavily utilised by local people for structural timber and traditional medicines, and is trampled by cattle and goats.

Remarks: *Gulella latimerae* resembles *G. newmani* sp. n. described below, in terms of its disjunct peristome with detached apertural tube, and the form of the major apertural teeth, however, the apertural tube is longer and more strongly descending in *G. newmani*, and the apertural rim of *G. latimerae* lacks superficial tubercles (more details given in the remarks pertaining to *G. newmani*). At first glance, the apertural dentition of *G. latimerae* also resembles that of *Gulella tharfieldensis* (Melvill & Ponsonby, 1893), and to a lesser extent *G. munita* (Melvill & Ponsonby, 1893), both from the Port Alfred-Grahamstown (Albany) area, particularly with regard to the well-developed labral and columellar teeth. However, their shells are narrower, less crisply sculptured and have a clearly interrupted peristome.

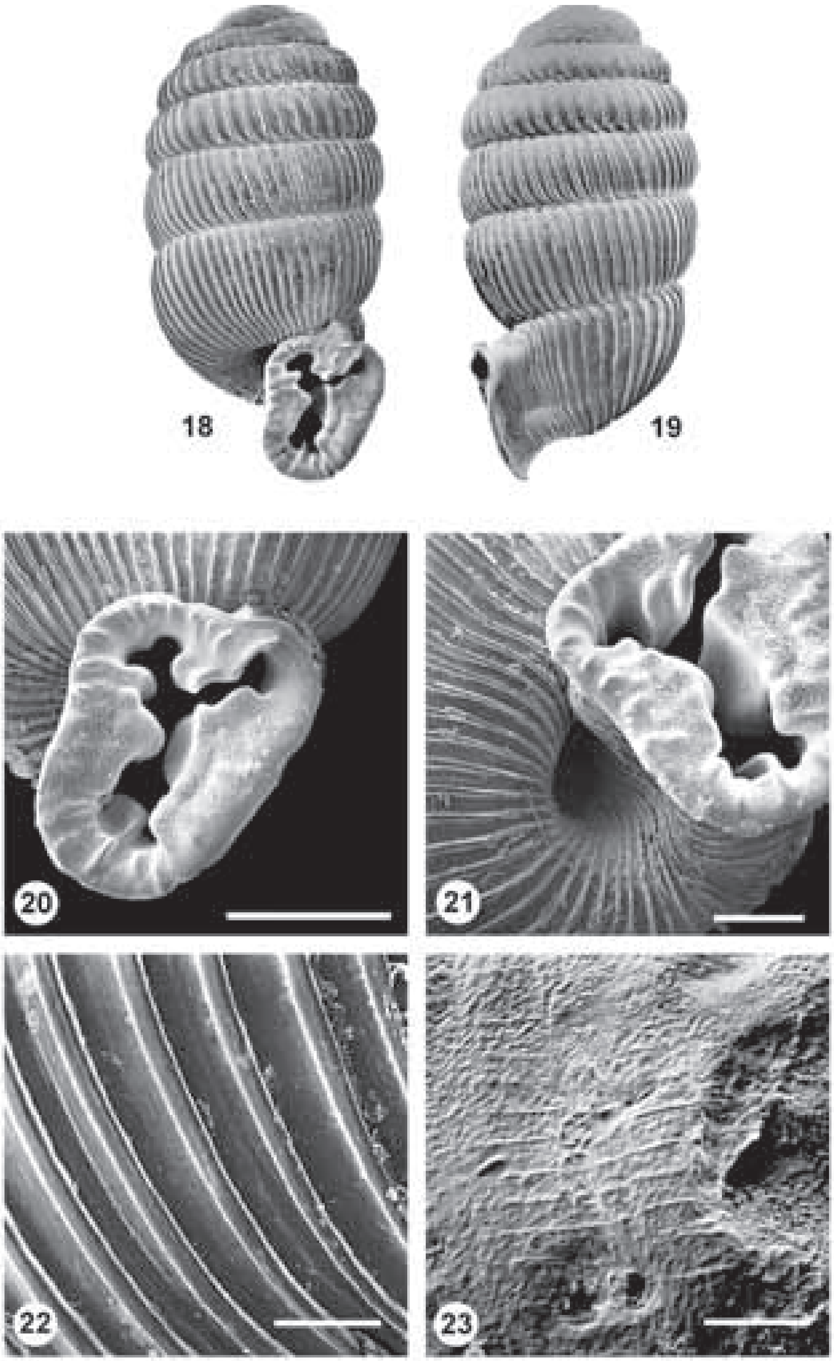
Gulella newmani sp. n.

Figs 18–24

Etymology: Named after Noggs Newman, a long-standing member of the Board of Trustees of East London Museum, and founder and honorary life member of the Border Shell Club.

Diagnosis: Shell very small, sub-cylindrical; sculptured with strong axial ribs; peristome entire, disjunct from preceding whorl and forming a detached apertural tube, margin strongly flaring; apertural dentition seven-fold, but edge of lip also set with short ridges or small denticles; umbilicus relatively wide (width approx. 1.6 mm).

Description: Shell very small, sub-cylindrical; length 3.7–3.8 mm, width 1.8–1.9 mm, length:width approx. 2.0. Embryonic shell approx. 0.98 mm in diameter, comprising approx. 2.25 whorls; superficial sculpture eroded, but with traces of close-set microscopic spiral threads (Fig. 23); junction between embryonic shell and teleoconch distinct. Teleoconch comprising approx. 5 whorls; whorls convex, suture indented; sculptured by well-developed, weakly prosocline axial ribs, extending from suture to suture (54 on penultimate whorl); rib intervals lacking obvious microsculpture and with no evidence of spiral threads (Fig. 22). Peristome entire; terminal part of last whorl disjunct from preceding whorl and drawn out into a distinct, trumpet-like, apertural tube; tube descending somewhat such that aperture is orientated slightly downwards (Fig. 19). Aperture markedly constricted by teeth; dentition 7-fold (Figs 20, 21): 1) a well-



Figs 18–23. *Gulella newmani* sp. n., holotype. 18, 19, apertural and lateral views of shell, length = 3.68 mm; 20, enlarged view of the aperture, bar = 0.5 mm; 21, umbilical region, bar = 0.25 mm; 22, detail of sculpture (first quarter of last whorl, bar = 75μm; 23, microsculpture on embryonic shell, partly eroded, bar = 30μm.

developed parietal lamella, outer portion strongly oblique, its margin strongly sinuous, a small rounded swelling on left where lamella curves to run into aperture; 2) a compound, broad-based labral tooth with a broad, roundly spathulate, in-running slab at its centre, two smaller denticles at upper and lower extremities of labral base, upper one forming basal part of labral sinus; 3) an in-running ridge in centre of base, thicker and curving to left internally; 4) a similar but weaker ridge to left, at base of columella (and partly obscured by it); 5) a broad-based, compound, superficial columella tooth with a strong triangular tooth at its centre (opposite central element of labral tooth), and a smaller ridge-like tooth running inwards above this; 6) a deep-set, flat-topped columella lamella, largely obscured by superficial columella tooth (not visible in figures); 7) a minute, low denticle at junction of columella and parietal lip. Flared portion of aperture margin with additional ornamentation in the form of small tubercles in parietal region and short, low ridges elsewhere, set at right angles to lip edge (Fig. 20), 20–25 in total, fading in the region of labral sinus. Exterior of apertural tube indented in region of parietal lamella, labral base and columella tooth. Uppermost part of apertural tube, behind labral sinus,

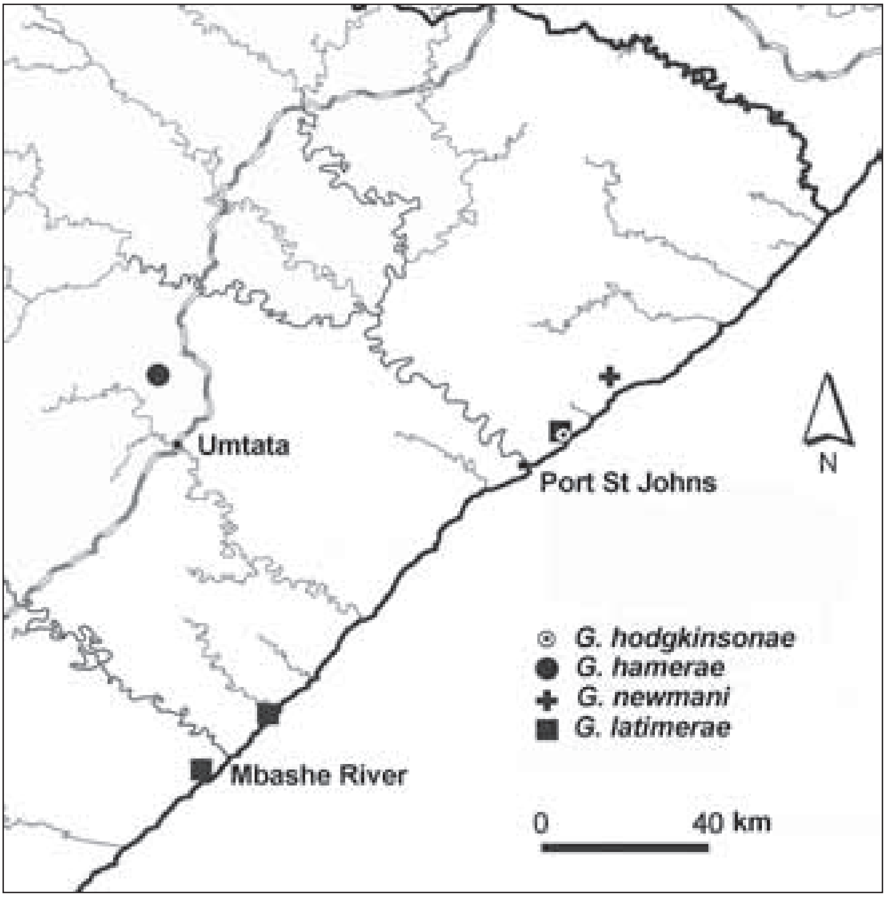


Fig. 24. Map of northern Eastern Cape showing distribution of new species.

with a keel-like ridge running from flared edge of peristome to base of penultimate whorl; peristome edge indented slightly above parietal lamella and columella portion weakly concave. Umbilicus relatively widely patent (width approx. 1.6 mm), its opening round to ovate (Fig. 21). Shell translucent, uniformly milky-white when fresh.

Type material: Holotype: NMSA W568/T1996, length 3.68 mm, width 1.84 mm. South Africa, Eastern Cape, Pondoland coast, Mbotyi (31º25.786'S:29º43.563'E), forest at top of coastal escarpment, in leaf-litter under log, leg. M. Bursey & D. Herbert, 03/iii/2003.

Paratype: ELM 13662, found together with holotype.

Distribution and habitat (Fig. 24): Known only from the type locality which comprises tall coastal forest with large trees and an understorey of species including *Buxus natalensis* (Oliv.) Hutch., *Memecylon bachmannii* Engl. and *Stangeria eriopus* (Kunze) Baill.; in leaf-litter.

Remarks: *Gulella newmani* resembles *G. latimerae* in its entire, flaring peristome and detached apertural tube, but the latter is longer and more steeply sloping in *G. newmani*, off-setting the aperture to the right. In addition, *G. latimerae* is larger and broader, and lacks the short ridges and tubercles circling the aperture lip, a feature evidently unique to *G. newmani* within the southern African streptaxid fauna. The general form of the apertural dentition is similar in the two species, but there are small differences, most notably in the form of the superficial columella tooth which is more obviously tricuspid in *G. newmani*, and the larger basal ridge which in *G. newmani* continues to the aperture edge, but stops well short of this in *G. latimerae.*

CONSERVATION

All four new species are evidently narrow-range endemics, *G. hamerae*, *G. dejae* and *G. newmani* are each known from only a single locality, whereas *G. latimerae* appears more widely distributed, but even so, it is known only from isolated patches of coastal forest spanning a linear distance of no more than 110 km. In terms of the IUCN red-listing criteria (IUCN 2001), the four species will undoubtedly qualify as threatened taxa and applications to this effect will be made after publication of their descriptions.

The forests of the Transkei region are considered to be of major conservation importance due to their rich biodiversity and high levels of endemism (Cooper & Swart 1992; Cloete & Bosa-Barlow 2000; Van Wyk & Smith 2001; De Villiers 2002; White 2002). Cooper & Swart (1992) considered Nqadu Forest, the only known locality for *Gulella hamerae*, and the Pondoland coastal forests in which the other three species are found, to be of highest conservation priority. Mostly, such assessments have focussed on plants and vertebrates, but analyses of invertebrate distributions indicate similar foci of diversity and endemism in this region (Herbert 2000; Bursey & Herbert 2001; Hamer & Slotow 2002; Herbert & Kilburn 2004). The four narrow-range endemics described herein are further evidence of this. In addition, they highlight the fact that the documentation of the invertebrate fauna of the region is far from complete.

Transkei forests, like most South African forests, have traditionally been utilised by local people as sources of natural products and for stock grazing. However, with reduction in forest extent and increased levels of utilisation, the sustainability of such practices has been compromised and they now represent a serious threat to the remaining forest patches (Cooper & Swart 1992; De Villiers 2002; De Villiers & White 2002; Von Maltitz & Fleming 2000; Cocks *et al.* 2004; Lawes *et al.* 2004). Some of the forests in which these new *Gulella* species occur appear to be in relatively good condition with comparatively low levels of utilisation, e.g. the scarp forest at Mbotyi, whilst others are heavily impacted through the removal of forest products, trampling by cattle and invasion by alien plants, e.g. near the mouth of the Mntafufu River, the single known locality for *G. dejae*. The forests in Dwesa Nature Reserve, one of the localities for *G. latimerae*, once enjoyed total protection, but this is no longer the case (Von Maltitz & Fleming 2000). Responsibility for management is in a state of flux (Kuhn *et al.* 2002).

An additional concern is the fact that small forest patches have been considered to be of little value for long-term conservation (Cooper & Swart 1992). However, such conclusions are drawn largely from the perspective of vertebrate animals, and do not take into consideration invertebrates of much more limited vagility, for which small forest patches may represent important refuges. An example of such is the new species of onychophoran discovered in a very small forest patch near Kokstad in KwaZulu-Natal (H. Ruhberg & M. Hamer *pers. comm.*). Kumqolo Forest, type locality for *G. latimerae*, is a small forest of less than 70 hectares in extent, yet it is known to contain at least six additional species of snail endemic to the Transkei coast, namely: *Natalina beyrichi* (Martens, 1890), *Gulella aprosdoketa* Connolly, 1939, *G. pondoensis* Connolly, 1939, and three undescribed species belonging to the genera *Archachatina*, *Sheldonia* and *Trachycystis*. To dismiss the role of small forests in biodiversity conservation could have serious implications for species such as these. Similarly, assessments of the impact of exploitation practices have focussed mostly on larger animals and plants (Geldenhuys 1997; De Villiers & White 2002), and activities that may have little impact on larger organisms, e.g. collection of fallen wood for fuel, may have profound effects for molluscs and other invertebrates (Simelane *et al.* 2000). An action plan for the conservation of the indigenous fauna of Transkei forests is urgently needed.

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REFERENCES

Adam, W. 1965. Mollusca Streptaxidae. Part LXXXV. Mission zoologique de l'I.R.S.A.C. en Afrique orientale. *Annales Musée Royal de l'Afrique centrale, Tervuren*, *Sciences Zoologiques* **138**: 3–50, plus 5 plates.

Bursey, M. & Herbert, D. G. 2001. Mkambati Game Reserve – another high diversity site for land snails. *Strandloper* **265**: 4–7.

Cloete, E. & Bosa-Barlow, A. 2000. Forest understorey plants of Port St. Johns. *In*: Seydack, A. H. W., Vermeulen, W. J. & Vermeulen, C., eds, *Natural Forests and Savannah Woodlands Symposium II. Towards sustainable management based on scientific understanding of natural forests and woodlands.* Pretoria: Department of Water Affairs and Forestry, pp. 250–251.

Cooper, K. H. & Swart, W. 1992. *Transkei forest survey*. Durban: Wildlife Society of southern Africa.

Cocks, M. L., Dold, A. P. & Grundy, I. M. 2004. The trade in medicinal plants from forests in the Eastern Cape Province. *In*: Lawes, M. J., Eeley, H. A. C., Shackleton, C. M. & Geach, B. G. S., eds, *Indigenous forests and woodlands in South Africa. Policy, people and practice*. Pietermaritzburg: University of KwaZulu-Natal Press, pp. 473–492.

De Villiers, D. J. 2002. *Impacts of human and biological factors on distributions of indigenous mammals in Transkei, with particular emphasis on the forest dwelling bushbuck* (Tragelaphus scriptus), *blue duiker* (Philantomba monticola) *and bushpig* (Potamochoerus porcus). MSc thesis, University of Transkei.

De Villiers, D. J. & White, R. M. 2002. Are current conservation practices conserving indigenous forest fauna? *In*: Seydack, A. H. W., Vorster, T., Vermeulen, W. J. & Van der Merwe, I. J., eds, *Natural Forests and Savannah Woodlands Symposium III. Multiple use management of natural forests and woodlands: policy refinements and scientific progress.* Pretoria: Department of Water Affairs and Forestry, pp. 110–121.

Geldenhuys, C. 1997. Sustainable harvesting of timber from woodlands in southern Africa: challenges for the future. *Southern African Forestry Journal* **178**: 59–72.

Hamer, M. L. & Slotow, R. 2002. Conservation application of existing data for South African millipedes (Diplopoda). *African Entomology* **10** (1): 29–42.

Herbert, D. G. 2000. Dwesa – a high diversity site for land snails. *Strandloper* **262**: 3–4.

Herbert, D. G. & Kilburn, R. N. 2004. *Field guide to the land snails and slugs of eastern South Africa*. Pietermaritzburg: Natal Museum.

IUCN, 2001. *IUCN Red List Categories and Criteria: Version 3.1*. Prepared by the IUCN Species Survival Commission. Gland, Switzerland and Cambridge, UK: IUCN.

Kuhn, A., Clarke, J. & Kock, J. 2002. From policy to practice: experiences with the implementation of forest policy in South Africa post-1994. *In*: Seydack, A. H. W., Vorster, T., Vermeulen, W. J. & Van der Merwe, I. J., eds, *Natural forests and savannah woodlands symposium III. Multiple use management of natural forests and woodlands: policy refinements and scientific progress.* Pretoria: Department of Water Affairs and Forestry, pp. 297–305.

Lawes, M. J., Obiri, J. A. F. & Eeley, H. A. C. 2004. The uses and value of indigenous forest resources in South Africa. *In*: Lawes, M. J., Eeley, H. A. C., Shackleton, C. M. & Geach, B. G. S., eds, *Indigenous forests and woodlands in South Africa. Policy, people and practice*. Pietermaritzburg: University of KwaZulu-Natal Press, pp. 227–273.

Simelane, T. S., Knight, M. H. & Kerley, G. I. H. 2000. Impact of fuelwood harvesting on conservation of invertebrate diversity. *In*: Seydack, A. H. W., Vermeulen, W. J. & Vermeulen, C., eds, *Natural forests and savannah woodlands symposium II. Towards sustainable management based on scientific understanding of natural forests and woodlands.* Pretoria: Department of Water Affairs and Forestry, pp. 348–354.

Van Wyk, A. E. & Smith, G. 2001. *Regions of floristic endemism in southern Africa: a review with emphasis on succulents*. Pretoria: Umdaus Press.

Von Maltitz, G. P. & Fleming, G. 2000. The status of conservation of indigenous forests in South Africa. *In*: Seydack, A. H. W., Vermeulen, W. J. & Vermeulen, C., eds, *Natural forests and savannah woodlands symposium II. Towards sustainable management based on scientific understanding of natural forests and woodlands*. Pretoria: Department of Water Affairs and Forestry, pp. 93–99.

White, R. M. 2002. Patterns of utilisation of indigenous forest fauna and other natural resources in the Transkei Region, Eastern Cape. *In*: Seydack, A. H. W., Vorster, T., Vermeulen, W. J. & Van der Merwe, I. J., eds, *Natural forests and savannah woodlands symposium III. Multiple use management of natural forests and woodlands: policy refinements and scientific progress.* Pretoria: Department of Water Affairs and Forestry, pp. 340–349.